

PATENT APPLN. NO. 10/067,918
RESPONSE UNDER 37 C.F.R. §1.111

**PATENT
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IN THE CLAIMS:

1. (currently amended) A heat-sensitive recording material which comprises

- (a) a support (S),
- (b2) a heat-sensitive recording layer (TG) containing an electron-donating compound and an electron-accepting compound and formed on at least one side of the support (S) and an adhesive layer (EB) comprising an electron beam-cured resin and formed on the heat-sensitive recording layer (TG), or
- (b3) an adhesive layer ~~formed~~ (EB) comprising an electron beam-cured resin and formed on at least one side of the support (S) and a heat-sensitive recording layer (TG) containing an electron-donating compound and an electron-accepting compound and formed on the adhesive layer (EB); and
- (c) a protective layer (OC) comprising a water-soluble resin and/or a water-dispersible resin, and optionally,
- (d) an intermediate layer (ML) comprising a water-soluble resin and/or a water-dispersible resin and formed between the heat-sensitive recording layer (TG) and the adhesive layer (EB),

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the protective layer (OC) being the outermost layer provided by being formed on a smooth-surfaced substrate and removing the smooth-surfaced substrate,

the smooth-surfaced substrate being 0.05 to 0.20 μm in root-mean-square average of roughness (JIS B0601-1982) as determined by an interference microscope (JIS B0652-1973),

the protective layer surface having a distinctness of image (according to JIS K 7105-1981) of at least 75% (slit width 2 mm), and

the adhesive layer containing a pigment having an average particle size of 0.2 to 3 μm .

2. (original) The heat-sensitive recording material according to claim 1, wherein the recorded portion formed by carrying out recording from the protective layer side with an energy of 80 mJ/mm^2 by a thermal head shows a distinctness of image (according to JIS K 7105-1981) of at least 75% (slit width 2 mm).

3. (original) The heat-sensitive recording material according to claim 1, wherein the recorded portion formed by carrying out recording from the protective layer side with an energy of 80 mJ/mm^2 by a thermal head is 0.15 to 0.50 μm in root-

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mean-square average of roughness (according to JIS B0601-1982) as determined by an interference microscope (JIS B0652-1973).

4. (original) The heat-sensitive recording material according to claim 1, wherein the recorded portion formed by carrying out recording from the protective layer side with an energy of 80 mJ/mm² by a thermal head exhibits a gloss (JIS P 8142-1993) of 30% or more at 20 degrees and 85% or more at 75 degrees.

5. (canceled)

6. (canceled)

7. (previously presented) The heat-sensitive recording material according to claim 1 which comprises:

- (a) the support (S),
- (b) the heat-sensitive recording layer (TG) formed on one side of the support (S), the intermediate layer (ML) formed on the heat-sensitive recording layer and the adhesive layer (EB) formed on the intermediate layer, and
- (c) the protective layer (OC) formed on the adhesive layer (EB).

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8. (canceled)

9. (previously presented) The heat-sensitive recording material according to claim 1, wherein the adhesive layer is provided by forming an uncured adhesive layer containing an electron beam-curable compound and curing the electron beam-curable compound by irradiation with electron beam.

10. (original) The heat-sensitive recording material according to claim 9, wherein the electron beam-curable compound is a hydroxyl group-containing electron beam-curable compound.

11. (original) The heat-sensitive recording material according to claim 10, wherein the hydroxyl group-containing electron beam-curable compound is 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, 2-hydroxy-3-phenoxypropyl acrylate or (meth)acrylic acid condensate of epichlorohydrin-alkanediol polymer.

12. (withdrawn) A process for producing a heat-sensitive recording material which comprises:

[[(e)]] (a) a support (S),

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- [[(f)]] (b2) ~~(b2)~~ a heat-sensitive recording layer (TG) containing an electron-donating compound and an electron-accepting compound formed on at least one side of the support (S) and an adhesive layer (EB) comprising an electron beam-cured resin and formed on the heat-sensitive recording layer (TG), ~~or~~
~~(b3) an adhesive layer (EB) comprising an electron beam-cured resin and formed on at least one side of the support (S) and the heat-sensitive recording layer (TG) containing an electron-donating compound and an electron-accepting compound and formed on the adhesive layer (EB); and~~
- [[(g)]] (c) a protective layer (OC) comprising a water-soluble resin and/or a water dispersible resin, and ~~optionally,~~
- [[(h)]] (d) an intermediate layer (ML) comprising a water-soluble soluble resin and/or a water-dispersible resin and formed between the heat-sensitive recording layer (TG) and the adhesive layer (EB),

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the protective layer surface having a distinctness of image of at least 75% (according to JIS K 7105-1981, slit width 2 mm), and

the adhesive layer containing a pigment having an average particle size of 0.2 to 3 μm ,

the process ~~comprising~~ comprising:

forming the protective layer on a smooth-surfaced substrate with a smooth surface which is about 0.05 to about 0.20 μm in root-mean-square average of roughness (according to JIS B0601-1982) as determined by an interference microscope (according to JIS B0652-1973),

combining the protective layer (OC) formed on the smooth-surfaced substrate with

a laminate comprising the support (S), the heat-sensitive recording layer (TG), the intermediate layer (ML) and an uncured adhesive layer comprising an electron beam-curable compound and the pigment having an average particle size of 0.2 to 3 μm in this order,

in such a manner that the protective layer (OC) is brought into contact with the uncured adhesive layer,

irradiating the combined product with an electron beam to cure the electron beam-curable compound and form the adhesive layer (EB) comprising an electron beam-cured resin, and

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removing the smooth-surfaced substrate.

13. (canceled)

14. (withdrawn) The process according to ~~claim 13~~ claim 12, wherein the adhesive layer contains said pigment having an average particle size of 0.2 to 3 μm in an amount of 2 to 30% by weight based on the adhesive layer.

15. (withdrawn) The process according to ~~claim 13~~ claim 12, wherein the electron beam-curable compound is a hydroxyl group-containing electron beam-curable compound.

16. (withdrawn) The process according to claim 15, wherein the hydroxyl group-containing electron beam-curable compound is 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, 2-hydroxy-3-phenoxypropyl acrylate or (meth)acrylic acid condensate of epichlorohydrin-alkanediol polymer.

17. (currently amended) The heat-sensitive recording material according to claim 1 which comprises:

- the support (S),

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- the adhesive layer (EB) formed on the support,
- the heat-sensitive recording layer (TG) formed on the adhesive layer (EB), and
- the protective layer (OC) formed on the ~~adhesive~~ heat-sensitive recording layer (TG).

18. (currently amended) The heat-sensitive recording material according to claim 1 which comprises:

- the support (S),
- the adhesive layer (EB) formed on the support,
- the intermediate layer (ML) formed on the adhesive layer,
- the heat-sensitive recording layer (TG) formed on the ~~adhesive~~ intermediate layer, and
- the protective layer (OC) formed on the ~~adhesive~~ heat-sensitive recording layer.

19. (new) A process for producing a heat-sensitive recording material which comprises:

- (a) a support (S),
- (b3) an adhesive layer (EB) comprising an electron beam-cured resin and formed on at least one side of the support (S) and a heat-sensitive recording layer (TG) containing an

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electron-donating compound and an electron-accepting compound and formed on the adhesive layer (EB);

- (c) a protective layer (OC) comprising a water-soluble resin and/or a water dispersible resin and formed on the heat-sensitive recording layer (TG), and
- (d) an intermediate layer (ML) comprising a water-soluble resin and/or a water-dispersible resin and formed between the heat-sensitive recording layer (TG) and the adhesive layer (EB),

the protective layer surface having a distinctness of image of at least 75% (according to JIS K 7105-1981, slit width 2 mm), and the adhesive layer containing a pigment having an average particle size of 0.2 to 3 μm ,

the process comprising:

forming the protective layer on a smooth-surfaced substrate with a smooth surface which is about 0.05 to about 0.20 μm in root-mean-square average of roughness (according to JIS B0601-1982) as determined by an interference microscope (according to JIS B0652-1973),

combining the protective layer (OC) formed on the smooth-surfaced substrate and the heat-sensitive recording layer (TG)

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formed on the protective layer and the intermediate layer (ML)
formed on the heat-sensitive recording layer with

a laminate comprising the support (S) and an uncured
adhesive layer comprising an electron beam-curable compound
and the pigment having an average particle size of 0.2 to 3 μm
in this order,

in such a manner that the intermediate layer (ML) is
brought into contact with the uncured adhesive layer,

irradiating the combined product with an electron beam to cure
the electron beam-curable compound and form the adhesive layer (EB)
comprising an electron beam-cured resin, and
removing the smooth-surfaced substrate.

20. (new) A process for producing a heat-sensitive
recording material which comprises:

- (a) a support (S),
- (b3) an adhesive layer (EB) comprising an electron beam-cured
resin and formed on at least one side of the support (S)
and a heat-sensitive recording layer (TG) containing an
electron-donating compound and an electron-accepting
compound and formed on the adhesive layer (EB); and

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(c) a protective layer (OC) comprising a water-soluble resin
and/or a water dispersible resin,
the protective layer surface having a distinctness of image of
at least 75% (according to JIS K 7105-1981, slit width 2 mm), and
the adhesive layer containing a pigment having an average
particle size of 0.2 to 3 μm ,
the process comprising:
forming the protective layer on a smooth-surfaced substrate
with a smooth surface which is about 0.05 to about 0.20 μm in root-
mean-square average of roughness (according to JIS B0601-1982) as
determined by an interference microscope (according to JIS B0652-
1973),
combining the support (S) with
a laminate comprising the smooth-surfaced substrate, the
protective layer (OC), the heat-sensitive recording layer
(TG), and an uncured adhesive layer comprising an electron
beam-curable compound in this order,
in such a manner that the uncured adhesive layer is
brought into contact with the support (S),
irradiating the combined product with an electron beam to cure
the electron beam-curable compound, and
removing the smooth-surfaced substrate.

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21. (new) The process according to claim 19, wherein the adhesive layer contains said pigment having an average particle size of 0.2 to 3 μm in an amount of 2 to 30% by weight based on the adhesive layer.

22. (new) The process according to claim 19, wherein the electron beam-curable compound is a hydroxyl group-containing electron beam-curable compound.

23. (new) The process according to claim 22, wherein the hydroxyl group-containing electron beam-curable compound is 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, 2-hydroxy-3-phenoxypropyl acrylate or (meth)acrylic acid condensate of epichlorohydrin-alkanediol polymer.

24. (new) The process according to claim 20, wherein the adhesive layer contains said pigment having an average particle size of 0.2 to 3 μm in an amount of 2 to 30% by weight based on the adhesive layer.

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25. (new) The process according to claim 20, wherein the electron beam-curable compound is a hydroxyl group-containing electron beam-curable compound.

26. (new) The process according to claim 25, wherein the hydroxyl group-containing electron beam-curable compound is 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, 2-hydroxy-3-phenoxypropyl acrylate or (meth)acrylic acid condensate of epichlorohydrin-alkanediol polymer.